PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

EXPRESS MAIL NO. EL521378012US

Applicant	:	David Jones
Application No.	:	Not yet Assigned
Filed	:	Concurrently Herewith
Title	:	DSL RATE ADAPTATION
Docket No.	:	41982/CAG/B600

PRELIMINARY AMENDMENT

Post Office Box 7068
Pasadena, CA 91109-7068
March 28, 2001

Assistant Commissioner for Patents
Washington, D.C. 20231

Commissioner:

Please amend the above-referenced application as follows:

In the Specification:

Please replace the paragraph at page 1, lines 4-6, with the following rewritten paragraph:

This application is a continuation of co-pending U.S. Application No. 09/309,340, filed May 11, 1999, which claims the benefit of U.S. Provisional Application No. 60/113,617, filed December 23, 1998.

In the Claims:

Please cancel claims 2, 3, 4, 18, 19 and 29 without prejudice.

Please amend claims 1, 5, 8,9-17, 21, 24-25, 30-33, 35-37, 39-56, and add new claims 57-64 as follows:

1. (Amended) A method for bidirectional data communication over a non-ideal transmission channel, comprising:

evaluating a channel response characteristic of a single QAM channel with respect to a transmission signal parametric set, the channel response characteristic comprising a bit error rate and a signal-to-noise ratio and the transmission signal parametric set comprising a constellation size and a spectral allocation;

varying said transmission signal parametric set by varying a stop frequency of the spectral allocation while maintaining a substantially constant start frequency of the spectral allocation so as to determine a maximum spectral allocation at which communication can occur without exceeding a predetermined signal-to-noise ratio;

re-evaluating said channel response characteristic with respect to said varied transmission signal parametric set; and

defining an optimal transmission signal parametric set for which the channel response characteristic allows optimization of at least one of a bit rate and a noise margin.

5. (Amended) The method according to claim 1, wherein the step of varying said transmission signal parametric set further comprises varying the constellation size by encoding a signal in conformance with a plurality of discrete constellation sizes so as to determine a maximum constellation size at which single QAM communication can occur without exceeding a predetermined bit error rate.

6. The method according to claim 5, wherein the step of varying the constellation size further comprises:

varying the constellation size while maintaining a substantially constant spectral allocation; and

repeating the constellation size varying step at a plurality of different discrete spectral allocations.

7. The method according to claim 1, wherein the step of varying said transmission signal parametric set comprises

varying the spectral allocation while maintaining a constant constellation size; and

repeating the spectral allocation varying step for a plurality of different discrete constellation sizes.

8. (Amended) A method for providing digital communication via twisted pair telephone lines and the like, the method comprising the steps of:

defining a frequency spectrum having a predetermined bandwidth within which communication between two transceivers is to be performed, the frequency spectrum comprising a beginning (Fstart) at a low frequency end thereof and an end (Fstop) at a high frequency end thereof;

defining a single QAM channel within the frequency spectrum, the single QAM channel having an initial bandwidth which is less than the bandwidth of the frequency spectrum;

communicating via the single QAM channel while varying the spectral allocation of the single QAM channel and while maintaining a constant constellation size;

determining a potential bit rate for each of a plurality of the spectral allocations at which communication was performed, the potential bit rate being determined using a potential constellation size for each spectral allocation determined via at least one of the measured signal to noise ratio (SNR) for that spectral allocation, a desired minimum signal to noise ratio (SNR) margin, and a given overall target bit rate;

selecting a spectral allocation having a highest one of the potential bit rates;

communicating while using the selected spectral allocation at its corresponding potential constellation size;

determining a value of a channel quality criteria;

continuing to communicate using the selected spectral allocation at its corresponding potential constellation size when the channel quality criteria indicates that the quality of the channel is above a predetermined threshold; and

reducing the constellation size to a new constellation size and determining the potential bit rate for the current spectral allocation and new constellation size when the channel quality criteria indicates that the channel quality criteria is below a predetermined threshold, then selecting a new spectral allocation having a highest one of

the potential bit rates and repeating the previous three steps and this step until the channel quality criteria indicates that the channel quality is no longer below the predetermined threshold for the selected spectral allocation, the communicating step being performed with other than the maximum constellation size, when other than the maximum constellation size will result in the maximum potential bit rate and an acceptable channel quality criteria.

9. (Amended) The method as recited in claim 8, wherein the step of defining the single QAM channel within the frequency spectrum comprises defining two channels within the frequency spectrum to facilitate full duplex communication.

10. (Amended) The method as recited in claim 8, wherein the step of defining the single QAM channel within the frequency spectrum comprises defining a single downstream QAM channel and a single upstream QAM channel within the frequency spectrum.

11. (Amended) The method as recited in claim 8, wherein the step of defining the single QAM channel within the frequency spectrum comprises defining a single upstream QAM channel proximate the beginning (FSstart) of the frequency spectrum and defining a single downstream QAM channel proximate the single upstream QAM channel, the single downstream QAM channel being formed within a higher frequency portion of the frequency spectrum than the single upstream QAM channel.

12. (Amended) The method as recited in claim 8, wherein the step of defining the single QAM channel within the frequency spectrum comprises defining a single downstream QAM channel proximate the beginning (FSstart) of the frequency spectrum and defining a single upstream QAM channel proximate the single downstream QAM channel, the single upstream QAM channel being formed within a higher frequency portion of the frequency spectrum than the single downstream QAM channel.

13. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the spectral allocation of the single QAM channel among a finite number of predetermined spectral allocations.

14. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the spectral allocation among 9 different predetermined spectral allocations.

15. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises sweeping the bandwidth between a minimum bandwidth and a maximum bandwidth.

16. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the bandwidth of the single QAM channel without varying a starting frequency (Fstart) of the single QAM channel.

17. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises using quadrature phase shift keying (QPSK) to effect communication.

20. The method as recited in claim 8, further comprising the step of defining a tabulation of the potential bit rates.

21. (Amended) The method for providing digital communication as recited in claim 8, further comprising the step of establishing a default communication link between

two transceivers prior to the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel.

22. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing a default link using pre-established communication parameters.

23. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing a full duplex default link.

24. (Amended) The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing a single upstream and a single downstream QAM channel, each of the single upstream and the single downstream QAM channels comprising a separate portion of the frequency spectrum.

25. (Amended) The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises the steps of:

establishing a single upstream QAM channel proximate the beginning (FSstart) of the frequency spectrum, the single upstream QAM channel having a pre-defined bandwidth;

establishing a default downstream channel proximate the upstream channel, the downstream channel having a predetermined bandwidth; and

wherein the sum of the bandwidths of the upstream channel and the downstream channel is less than the bandwidth of the frequency spectrum so as to facilitate expansion of the downstream channel.

26. The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises the steps of:

establishing a downstream channel proximate the beginning (FSstart) of the frequency spectrum, the downstream channel having a pre-defined bandwidth;

establishing a default upstream channel proximate the downstream channel, the upstream channel having a predetermined bandwidth; and

wherein the sum of the bandwidths of the downstream channel and the upstream channel is less than the bandwidth of the frequency spectrum so as to facilitate expansion of the upstream channel.

27. The method for providing digital communication as recited in claim 21, further comprising the step of designating one of the two transceivers as a master transceiver and the other of the two transceivers as a slave transceiver so as to facilitate initialization of the default link without contention.

28. The method for providing digital communication as recited in claim 21, further comprising the step of using a contention routine to mitigate contention during initialization of the default link.

30. (Amended) The method for providing digital communications as recited in claim 8, wherein the channel quality criteria comprises a bit error rate (BER).

31. (Amended) A method for enhancing a bit rate and/or margin at which single quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

defining a plurality of spectral allocations, wherein each spectral allocation relates to a single QAM channel, each spectral allocation having an approximately equal starting frequency; and

defining a combination of one of the defined spectral allocations and a constellation size at which bit rate and/or margin is enhanced, wherein each constellation size relates to a single QAM channel.

32. (Amended) An xDSL transceiver comprising

a transmit spectrum control circuit for varying a spectral allocation of a single QAM channel with which encoding is performed;

a transmit constellation size control circuit for varying a constellation size with which encoding is performed; and

wherein the transmit spectrum control and transmit constellation size control circuits cooperate to define a combination of the spectral allocation and the constellation size at which bit rate and/or margin is enhanced.

33. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to vary the spectral allocation of at least one of a downstream channel and an upstream channel.

34. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to vary the spectral allocation in discrete increments.

35. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a stop frequency of at least one of a downstream channel and an upstream channel in a continuous manner.

36. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a symbol rate and center frequency of at least one of a downstream channel and an upstream channel in a continuous manner.

37. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the constellation size while maintaining a constant spectral allocation.

38. The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the spectral allocation while maintaining a constant constellation size.

39. (Amended) The xDSL transceiver as recited in claim 32, further comprising a receive spectrum control circuit for varying the spectral allocation with which decoding is performed.

40. (Amended) The xDSL transceiver as recited in claim 32, further comprising a receive constellation size control circuit for varying the constellation size with which decoding is performed.

41. (Amended) A method for enhancing a bit rate and/or margin at which quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a start frequency and a stop frequency thereof; and

defining a combination of the spectral allocation and the constellation size at which bit rate and/or margin is enhanced.

42. (Amended) The method as recited in claim 41, wherein the step of varying the spectral allocation comprises varying the start frequency and the stop frequency in discrete increments.

43. (Amended) The method as recited in claim 41, wherein the step of varying the spectral allocation comprises sweeping the start frequency and the stop frequency in a continuous manner.

44. (Amended) The method as recited in claim 41, wherein the step of varying the constellation size comprises utilizing a plurality of different constellation sizes so as to determine a maximum constellation size at which communication can occur.

45. (Amended) The method as recited in claim 41, wherein the step of varying the constellation size comprises utilizing a plurality of different constellation sizes so as to

determine a maximum constellation size at which communication can occur without exceeding a predetermined bit error rate (BER).

46. (Amended) The method as recited in claim 41, wherein the step of varying the spectral allocation and the constellation size comprises varying the constellation size while maintaining a constant spectral allocation and repeating this step for a plurality of different spectral allocations.

47. (Amended) The method as recited in claim 41, wherein the step of varying the spectral allocation and the constellation size comprises varying the spectral allocation while maintaining a constant constellation size for a plurality of different constellation sizes.

48. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit rate is enhanced when the target bit rate cannot be achieved and defining a combination of the spectral allocation and the constellation size at which margin is enhanced when the target bit rate is achieved.

49. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a constant start frequency thereof, so as to

mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the_constellation size at which bit rate is enhanced while providing at least one of a minimum margin and a maximum bit error rate.

50. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the_constellation size at which margin is enhanced while providing a desired bit rate.

51. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the_constellation size at which a desired bit rate is achieved and margin is maximized.

52. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit rate is enhanced when a target bit rate cannot be achieved and defining a combination of the_spectral allocation and the constellation size of which bit error rate is reduced when the target bit rate is achieved.

53. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit error rate is minimized while providing a desired bit rate.

54. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of_the single QAM channel; and

defining a combination of the spectral allocation and the_constellation size at which a desired bit rate is achieved and bit error rate is minimized.

55. (Amended) A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions_of a single QAM channel;

a modulator coupled to modulate encoded digital data transmissions of the single QAM channel;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a transmit spectrum control coupled to vary a spectrum allocation of the single QAM channel, wherein the spectral allocation is varied by varying a symbol rate and a center frequency of the single QAM channel, with which the encoder encodes the digital data transmissions and with which the modulator modulates the encoded digital data transmissions; and

a transmit constellation size control coupled to vary [a] the constellation size with which the encoder encodes digital data transmissions of the single QAM channel.

56. (Amended) A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions_of a single QAM channel;

a modulator coupled to modulate encoded digital data transmissions of the single QAM channel;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a receive spectrum control coupled to vary a spectrum allocation of the single QAM channel, wherein the spectral allocation of the single QAM channel is varied by varying a symbol rate and a center frequency of the single QAM channel, with which the demodulator demodulates the received digital data and with which the decoder decodes the demodulated received digital data; and

a receive constellation size control coupled to vary a constellation size with which the decoder decodes demodulated received digital data of the single QAM channel.

57. (New) The method as recited in claim 8, wherein the spectral allocation of the single QAM channel is varied by varying a symbol rate and a center frequency of the single QAM channel.

58. (New) The method as recited in claim 57, wherein the symbol rate and the center frequency are varied simultaneously.

59. (New) The xDSL transceiver as recited in claim 32, wherein the spectral allocation of the single QAM channel is varied while maintaining a constant constellation

size, wherein the spectral allocation of the single QAM channel is varied by varying a symbol rate and a center frequency of the single QAM channel.

60. (New) The method as recited in claim 59, wherein the symbol rate and the center frequency are varied simultaneously.

61. (New) The method as recited in claim 41, wherein the start frequency and the stop frequency are varied by varying a symbol rate and a center frequency of the single QAM channel.

62. (New) The method as recited in claim 61, wherein the symbol rate and the center frequency are varied simultaneously.

63. (New) The method as recited in claim 55, wherein the symbol rate and the center frequency are varied simultaneously.

64. (New) The method as recited in claim 56, wherein the symbol rate and the center frequency are varied simultaneously.

REMARKS

Claims 1, 5-17, 20-28, and 30-64 are in the application. Claims 2, 3, 4, 18, 19, and 29 have been cancelled without prejudice. Claims 1, 5, 8, 30-33, 35-37, and 39-56 have been amended. Claims 57-64 have been added. The specification has been amended to place it in better form.

Claims 1 and 5-56 were rejected in the office action dated August 30, 2000 of the parent application, serial no. 09/309,340, under 35 U.S.C. §102(e) as allegedly being anticipated by Tzannes et al. (U.S. Patent No. 6,072,779) and under 35 U.S.C. § 102(b) as allegedly being anticipated by Gelblum et al. (U.S. Patent No. 6,088,387) and by Williams (U.S. Patent No. 5,598,435).

This preliminary amendment is being filed in the above-identified continuation application in response to the rejections of the August 30, 2000 office action of the parent

application, serial no. 09/309,340. The foregoing amendments and accompanying remarks address the rejections voiced in the rejection of the parent application, and put forth in detail the novel aspects of the Applicant's approach over the prior art of record. Applicant respectfully requests entry of the amendment and reconsideration of this application.

Applicant's independent claims 1, 8, 31, 32, 41, and 48-56, as amended, are directed to single channel Quadrature Amplitude Modulation (QAM) communications based on Single Carrier Modulation (SCM). The single channel communications system is clearly supported in the application. For example, the specification repeatedly refers to QAM communications, and those skilled in the art will recognize that the system illustrated in Figures 1 and 2 illustrate block diagrams for single channel QAM transmitters as opposed to multi-channel communications. Additionally, those skilled in the art will recognize and appreciate that the equation provided in page 10, line 28 applies to single channel QAM systems. Single channel communication systems, or systems based on SCM, utilize a single channel per transmission band. Thus, for example, with four transmission bands, a SCM system utilizes four total QAM signals, a single QAM channel or signal for each band.

In contrast to Applicant's amended claims, Multi Carrier Modulation (MCM) systems, such as MCM systems described in the Tzannes, Gelblum, and Williams references cited in the August 30, 2000 office action of the parent application, utilize multiple subchannels per band. More specifically, MCM systems utilize multiple subchannels (f1, f2,...f) per band, and each subchannel carries a signal, such as an individual QAM modulated signal. MCM systems typically utilize multiple QAM signals per band. In MCM systems, each QAM signal has a fixed symbol rate and center frequency. Bandwidth is adjusted by varying the number of active subchannels. In other words, bandwidth is adjusted by adjusting the number of active subchannels.

SCM systems are different than MCM systems in that bandwidth in SCM systems can not be varied by enabling and disabling individual subchannels. Disabling the only QAM channel in a band effectively disables an entire transmission band. Thus, MCM systems and SCM systems vary bandwidth in different manners and consider different factors in varying bandwidth.

In order to generally distinguish the Applicant's approach based on single channel QAM communications, from communication systems using MCM modulation, the claims

have been amended to point out the single QAM channel aspect. For example, claim 8 recites in part:

> "defining a single QAM channel within the frequency spectrum, the single QAM channel having an initial bandwidth which is less than the bandwidth of the frequency spectrum"

Other claims have been amended with similar single QAM channel language.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version With Marking To Show Changes Made."**

In view of the amendments made at this time and the foregoing remarks, reconsideration of claims 1, 5-17, 20-28, and 30-64 and allowance of this application are respectfully requested.

Respectfully submitted,

CHRISTIE, PARKER & HALE, LLP

By Craig A. Gelfound

Craig A. Gelfound
Reg. No. 41,032
626/795-9900

GDL/gdl
CEH PAS338139.1-*-3/28/01 1.37 PM

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification

Paragraph beginning at lines 4-6 of page 1 has been amended as follows:

~~This patent application claims the benefit of the filing date of United States Provisional Patent Application Serial No. 60/113,617, filed December 23, 1998 and entitled DSL RATE ADAPTATION, the contents of which are hereby incorporated by reference" with~~

This application is a continuation of co-pending U.S. Application No. 09/309,340, filed May 11, 1999, which claims the benefit of U.S. Provisional Application No. 60/113,617, filed December 23, 1998.

In the Claims

1. (Amended) A method for bidirectional data communication over a non-ideal transmission channel, comprising:

evaluating a channel response characteristic of a single QAM channel with respect to a transmission signal parametric set, the channel response characteristic comprising a bit error rate and a signal-to-noise ratio and the transmission signal parametric set comprising a constellation size and a spectral allocation;

varying said transmission signal parametric set by varying a stop frequency of the spectral allocation while maintaining a substantially constant start frequency of the spectral allocation so as to determine a maximum spectral allocation at which communication can occur without exceeding a predetermined signal-to-noise ratio;

re-evaluating said channel response characteristic with respect to said varied transmission signal parametric set; and

defining an optimal transmission signal parametric set for which the channel response characteristic allows optimization of at least one of a bit rate and a noise margin.

5. (Amended) The method according to claim 1, wherein the step of varying said transmission signal parametric set further comprises varying the constellation size by encoding a signal in conformance with a plurality of discrete constellation sizes so as to

determine a maximum constellation size at which single QAM communication can occur without exceeding a predetermined bit error rate.

8. (Amended) A method for providing digital communication via twisted pair telephone lines and the like, the method comprising the steps of:

defining a frequency spectrum having a predetermined bandwidth within which communication between two transceivers is to be performed, the frequency spectrum comprising a beginning (Fstart) at a low frequency end thereof and an end (Fstop) at a high frequency end thereof;

defining ~~at least one~~ a single QAM channel within the frequency spectrum, the single QAM channel having an initial bandwidth which is ~~substantially~~ less than the bandwidth of the frequency spectrum;

communicating via the single QAM channel while varying the spectral allocation of the single QAM channel and while maintaining a constant constellation size;

determining a potential bit rate for each of a plurality of the spectral allocations at which communication was performed, the potential bit rate being determined using a potential constellation size for each spectral allocation determined via at least one of the measured signal to noise ratio (SNR) for that spectral allocation, a desired minimum signal to noise ratio (SNR) margin, and a given overall target bit rate;

selecting a spectral allocation having a highest one of the potential bit rates;

communicating while using the selected spectral allocation at its corresponding potential constellation size;

determining a value of a channel quality criteria;

continuing to communicate using the selected spectral allocation at its corresponding potential constellation size when the channel quality criteria indicates that the quality of the channel is above a predetermined threshold; and

reducing the constellation size to a new constellation size and determining the potential bit rate for the current spectral allocation and new constellation size when the channel quality criteria indicates that the channel quality criteria is below a predetermined threshold, then selecting a new spectral allocation having a highest one of the potential bit rates and repeating the previous three steps and this step until the

channel quality criteria indicates that the channel quality is no longer below the predetermined threshold for the selected spectral allocation, the communicating step being performed with other than the maximum constellation size, when other than the maximum constellation size will result in the maximum potential bit rate and an acceptable channel quality criteria.

9. (Amended) The method as recited in claim 8, wherein the step of defining ~~at least one~~ the single QAM channel within the frequency spectrum comprises defining two channels within the frequency spectrum to facilitate full duplex communication.

10. (Amended) The method as recited in claim 8, wherein the step of defining ~~at least one~~ the single QAM channel within the frequency spectrum comprises defining a single downstream QAM channel and ~~an~~ a single upstream QAM channel within the frequency spectrum.

11. (Amended) The method as recited in claim 8, wherein the step of defining ~~at least one~~ the single QAM channel within the frequency spectrum comprises defining ~~an~~ a single upstream QAM channel proximate the beginning (FSstart) of the frequency spectrum and defining a single downstream QAM channel proximate the single upstream QAM channel, the single downstream QAM channel being formed within a higher frequency portion of the frequency spectrum than the single upstream QAM channel.

12. (Amended) The method as recited in claim 8, wherein the step of defining ~~at least one~~ the single QAM channel within the frequency spectrum comprises defining a single downstream QAM channel proximate the beginning (FSstart) of the frequency spectrum and defining ~~an~~ a single upstream QAM channel proximate the single downstream QAM channel, the single upstream QAM channel being formed within a higher frequency portion of the frequency spectrum than the single downstream QAM channel.

13. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the spectral allocation of the single QAM channel among a finite number of predetermined spectral allocations.

14. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the spectral allocation among 9 different predetermined spectral allocations.

15. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises sweeping the bandwidth between a minimum bandwidth and a maximum bandwidth.

16. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises varying the bandwidth of the single QAM channel without varying a starting frequency (Fstart) of the single QAM channel.

17. (Amended) The method as recited in claim 8, wherein the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel comprises using quadrature phase shift keying (QPSK) to effect communication.

21. (Amended) The method for providing digital communication as recited in claim 8, further comprising the step of establishing a default communication link between two transceivers prior to the step of communicating via the single QAM channel while varying the spectral allocation of the single QAM channel.

24. (Amended) The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises establishing ~~an~~ a single upstream and a single downstream QAM channel, each of the single upstream and the single downstream QAM channels comprising a separate portion of the frequency spectrum.

25. (Amended) The method for providing digital communication as recited in claim 21, wherein the step of establishing the default link comprises the steps of:

establishing ~~an~~ a single upstream QAM channel proximate the beginning (FSstart) of the frequency spectrum, the single upstream QAM channel having a pre-defined bandwidth;

establishing a default downstream channel proximate the single upstream channel, the single downstream channel having a predetermined bandwidth; and

wherein the sum of the bandwidths of the single upstream channel and the single downstream channel is less than the bandwidth of the frequency spectrum so as to facilitate expansion of the single downstream channel.

30. (Amended) The method for providing digital communications as recited in claim 8, wherein the channel quality criteria comprises ~~at least one of~~ a bit error rate (BER).

31. (Amended) A method for enhancing a bit rate and/or margin at which single quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

defining a plurality of spectral allocations, wherein each spectral allocation relates to a single QAM channel, each spectral allocation having an approximately equal starting frequency; and

defining a combination of one of the defined spectral allocations and a constellation size at which bit rate and/or margin is enhanced, wherein each constellation size relates to a single QAM channel.

32. (Amended) An xDSL transceiver comprising

a transmit spectrum control circuit for varying a spectral allocation of a single QAM channel with which encoding is performed;

a transmit constellation size control circuit for varying a constellation size with which encoding is performed; and

wherein the transmit spectrum control and transmit constellation size control circuits cooperate to define a combination of the spectral allocation and the constellation size at which bit rate and/or margin is enhanced.

33. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to vary ~~a~~ the spectral allocation of at least one of a downstream channel and an upstream channel.

35. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a stop frequency of at least one of a downstream channel and an upstream channel in a ~~substantially~~ continuous manner.

36. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control circuit is configured to sweep a symbol rate and center frequency of at least one of a downstream channel and an upstream channel in a ~~substantially~~ continuous manner.

37. (Amended) The xDSL transceiver as recited in claim 32, wherein the transmit spectrum control and transmit constellation size control circuits are configured to cooperate to vary the constellation size while maintaining a ~~substantially~~ constant spectral allocation.

39. (Amended) The xDSL transceiver as recited in claim 32, further comprising a receive spectrum control circuit for varying ~~a~~ the spectral allocation with which decoding is performed.

40. (Amended) The xDSL transceiver as recited in claim 32, further comprising a receive constellation size control circuit for varying ~~a~~ the constellation size with which decoding is performed.

41. (Amended) A method for enhancing a bit rate and/or margin at which quadrature amplitude modulated (QAM) communication is performed, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a start frequency and a stop frequency thereof; and

defining a combination of the spectral allocation and the constellation size at which bit rate and/or margin is enhanced.

42. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the spectral allocation comprises varying the start frequency and the stop frequency in discrete increments.

43. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the spectral allocation comprises sweeping the start frequency and the stop frequency in a ~~substantially~~ continuous manner.

44. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the constellation size comprises utilizing a plurality of different constellation sizes so as to determine a maximum constellation size at which communication can occur.

45. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the constellation size comprises utilizing a plurality of different constellation sizes so as to determine a maximum constellation size at which communication can occur without exceeding a predetermined bit error rate (BER).

46. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the spectral allocation and the constellation size comprises varying the constellation size while maintaining a ~~substantially~~ constant spectral allocation and repeating this step for a plurality of different spectral allocations.

47. (Amended) The method as recited in claim 41, wherein the step of varying ~~a~~ the spectral allocation and the constellation size comprises varying the spectral allocation while maintaining a constant constellation size for a plurality of different constellation sizes.

48. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a ~~substantially~~ constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit rate is enhanced when [a] the target bit rate cannot be achieved and defining a combination of the spectral allocation and the constellation size at which margin is enhanced when the target bit rate is achieved.

49. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a ~~substantially~~ constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit rate is enhanced while providing at least one of a minimum margin and a maximum bit error rate.

50. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a ~~substantially~~ constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which margin is enhanced while providing a desired bit rate.

51. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a ~~substantially~~ constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which a desired bit rate is achieved and margin is maximized.

52. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a ~~substantially~~ constant start frequency thereof,

so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit rate is enhanced when a target bit rate cannot be achieved and defining a combination of the spectral allocation and the constellation size of which bit error rate is reduced when the target bit rate is achieved.

53. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which bit error rate is minimized while providing a desired bit rate.

54. (Amended) A method for enhancing quadrature amplitude modulated (QAM) communications, the method comprising the steps of:

varying a spectral allocation and constellation size of a single QAM channel with which communication is performed, wherein the spectral allocation is varied by varying a stop frequency thereof while maintaining a substantially constant start frequency thereof, so as to mitigate high frequency content of the spectral allocation, wherein varying the spectral allocation further comprises varying a symbol rate and a center frequency of the single QAM channel; and

defining a combination of the spectral allocation and the constellation size at which a desired bit rate is achieved and bit error rate is minimized.

55. (Amended) A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions of a single QAM channel;

a modulator coupled to modulate encoded digital data transmissions of the single QAM channel;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a transmit spectrum control coupled to vary a spectrum allocation of the single QAM channel, wherein the spectral allocation is varied by varying a symbol rate and a center frequency of the single QAM channel, with which the encoder encodes the digital data transmissions and with which the modulator modulates the encoded digital data transmissions; and

a transmit constellation size control coupled to vary [a] the constellation size with which the encoder encodes digital data transmissions of the single QAM channel.

56. (Amended) A bidirectional data communication device of the type in which spectrum allocation and constellation size are communication parameters, comprising:

a transmitter portion including:

an encoder coupled to encode digital data transmissions of a single QAM channel;

a modulator coupled to modulate encoded digital data transmissions of the single QAM channel;

a digital to analog converter coupled to convert modulated digital data transmissions into analog data transmissions;

an electronic hybrid coupled to separate received analog data from transmitted analog data;

a receiver portion including:

an analog to digital converter coupled to convert the received analog data into digital data;

a demodulator coupled to demodulate received digital data;

a decoder coupled to decode demodulated received digital data;

a receive spectrum control coupled to vary a spectrum allocation of the single QAM channel, wherein the spectral allocation of the single QAM channel is varied by varying a symbol rate and a center frequency of the single QAM channel, with which the demodulator demodulates the received digital data and with which the decoder decodes the demodulated received digital data; and

a receive constellation size control coupled to vary a constellation size with which the decoder decodes demodulated received digital data of the single QAM channel.

::ODMA\MHODMA\CPHPAS;338139;1